



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of

STEVEN LUO,
KOJI MASAKI, and
TATSURO HAMADA

Serial No. 09/923,983

Filed August 7, 2001

For STABILIZING HIGH-VINYL
POLYBUTADIENE

) Group Art Unit: 1713

) Examiner: Rip A. Lee

) CERTIFICATE OF MAILING

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) Kimberly A. Bright, Secy. to Arthur M. Reginelli

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APPELLANTS' BRIEF PURSUANT TO 37 C.F.R. 1.192

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ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

Dear Sir:

This is an appeal to the Board of Patent Appeals from the final rejections in the Office Action mailed April 18, 2003. The Notice of Appeal was mailed on July 18, 2003. The present appeal is of claims 1,2, 4-10, 12-19, 21 and 22. This Appeal Brief is submitted in triplicate.

I. REAL PARTY IN INTEREST

The owner of the present patent application is Bridgestone Corporation.

II. RELATED APPEALS AND INTERFERENCES

Appellant and Appellant's legal representatives are not aware of any related appeals or interferences that would directly affect or would be directly affected by, or have a bearing on the Board's decision in the present pending appeal.

III. STATUS OF CLAIMS

The present application was filed on August 7, 2001. At the time of filing, the application included claims 1-20. In an Office Action dated April 15, 2002, claims

1-5 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 4,501,867 to Ueno et al. in view of U.S. Patent 5,298,562 to Ceska et al. The Examiner also rejected claims 1-5 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 6,117,956 to Luo in view of U.S. Patent 5,298,562 to Ceska et al. Claims 1-5 were rejected under 35 U.S.C. §103(a) as being unpatentable over Japanese Patent 57-55950 to Oozeki in view of U.S. Patent 5,298,562 to Ceska et al. Further, the Examiner objected to claim 4 for improper form. Additionally, the Examiner withdrew from consideration claims 6-20, having asserted a restriction requirement. In Response and Amendment A filed July 15, 2002, claim 4 was amended and new claims 21-23 were added. Appellants traversed the restriction requirement.

The Examiner withdrew the rejections of record in a second Office Action mailed November 5, 2002. New rejections were made however, under 35 U.S.C. §§ 102(b) and 103(a). Namely, the Examiner rejected claims 1, 2, 4, 5, 21, and 22 as anticipated by U.S. Patent 3,935,160 to Kline. Claim 3 was rejected as obvious over Kline in view of U.S. Patent 6,117,956 to Luo. Further, the Examiner objected to claim 23. In a Response and Amendment filed February 5, 2003, colorable amendments were made to claims 1-2, 6, 8-10, 12-13, 16-19, 21 and 22, and claims 3 and 23 were cancelled. Appellants also submitted a declaration under 37 C.F.R. § 1.132.

The Examiner issued a final rejection on April 18, 2003, rejecting claims 1, 2, 4, 5, 21, and 22 under 35 U.S.C. § 103(a) as unpatentable over U.S. Patent 3,935,160 to Kline in view of U.S. Patent 6,117,956 to Luo, even though the Examiner withdrew the rejection of claims 1, 2, 4, 5, 21 and 22 under 35 U.S.C. 102(b). Appellants filed a Notice of Appeal on July 18, 2003.

IV. STATUS OF AMENDMENTS

No Response and Amendment After Final was filed, and therefore the status of the claims on appeal are as they stood with the Examiner at the time of the Response and Amendment filed on February 5, 2003.

V. SUMMARY OF THE INVENTION

The claimed invention generally relates to a method of stabilizing syndiotactic 1,2-polybutadiene from thermal crosslinking and the resulting stabilized syndiotactic 1,2-polybutadiene compositions.

As the Appellants disclose in their written description, the effectiveness of 2,6-dihydrocarbyl-4-(dihydrocarbylaminomethyl)phenols to prevent thermal crosslinking of high-vinyl polybutadienes was unexpected.¹ This discovery was unexpected because many antioxidants, including those that are structurally similar to 2,6-dihydrocarbyl-4-(dihydrocarbylaminomethyl)phenol, are not capable of stabilizing syndiotactic 1,2-polybutadiene. This is true despite the fact that many of these other antioxidants are commonly used to stabilize many other rubbers.²

The Appellants' written description provides sufficient evidence of this unexpected discovery. Specifically, the Appellants conducted testing to compare the effectiveness of 2,6-di-*t*-butyl-4-(dimethylaminomethyl)phenol versus other commonly used stabilizers including 2,6-di-*t*-butyl-4-methylphenol.³ Notably, each of eight different commonly employed stabilizers failed to stabilize syndiotactic 1,2-polybutadiene.⁴ But, the Appellants surprisingly found that 2,6-di-*t*-butyl-4-(dimethylaminomethyl)phenol stabilized syndiotactic 1,2-polybutadiene to an extent that no gel was found under the test conditions.⁵ In other words, there was no comparison between the compounds under these test conditions. This is true despite the fact that some of these comparative compounds are structurally similar to the claimed compounds.

VI. ISSUES

The issue of the present appeal is whether:

(i.) Claims 1, 2, 4, 5, 21 and 22 are patentable over U.S. Patent 3,935,160 to Kline in view of U.S. Patent 6,117,956 to Luo;

(ii.) Claims 6-10 and 12-19 are not properly subject to a restriction requirement and, in any event should be rejoined upon allowance of the elected claims.

¹Written description page 4, lines 20-22.

²Written description page 4, lines 23-25.

³Written description page 13, line 30-page 15, line 16.

⁴Written description page 15, lines 11-16.

VII. GROUPING OF CLAIMS

With respect to grouping of the claims:

Claim 1 is an independent claim directed to a stabilized syndiotactic 1,2-polybutadiene composition.

Claims 2, 21 and 22 contain an additional limitation directed to the amount of antioxidant present in the claimed composition. Appellants believe that this provides a separate basis of patentability for claims 2, 21 and 22.

Claims 4 and 5 ultimately depend from claim 1, and therefore stand or fall with claim 1 in view of the present rejection.

Claim 6 is an independent claim that is directed toward a method for stabilizing syndiotactic 1,2-polybutadiene from thermal crosslinking, and claims 7-10 ultimately depend from claim 6. In view of the issues on appeal, claims 7-10 stand or fall with independent claim 6.

Claim 12 is an independent claim that is directed toward a method for preparing a vulcanizable composition, and Claims 13-19 depend from claim 12. Claims 13-19 stand or fall with independent claim 12 in view of the rejections on appeal.

Each independent claim is separately patentable and therefore they do not stand or fall together.

VIII. ARGUMENT

The Examiner has rejected claims 1, 2, 4, 5, 21, and 22 under 35 U.S.C. § 103(a) as being unpatentable over Kline in view of U.S. Patent No. 6,117,956 to Luo. According to the Examiner, Kline teaches the addition of dialkylaminomethyl phenols to stereoregular diene polymers to prevent oxidative degradation without concomitant discoloration. The Examiner has found that Kline teaches that those stereoregular polymers containing residues of transition metal catalysts will benefit by its teachings. Because the polymers of Luo are prepared with transition metal catalyst systems, the Examiner believes it would have been obvious to combine the teachings of Kline to prevent oxidative degradation associated with the polymers of Luo.

⁵Written description page 14, lines 18-26.

In order to combine two or more references to establish a *prima facie* case of obviousness, there must be a suggestion or motivation to combine the reference teachings, and a reasonable expectation of success.⁶

Appellants' arguments are two-fold:

- A. The Examiner has failed to establish a *prima facie* case of obviousness, because there is no motivation for one of skill in the art to combine the references with a reasonable expectation of success.
- B. Appellants have effectively rebutted any alleged *prima facie* case of obviousness with objective evidence of unexpected results.

A. THE EXAMINER HAS FAILED TO ESTABLISH A PRIMA FACIE CASE OF OBVIOUSNESS

To show that one of ordinary skill in the art would have been motivated to combine the teachings of Kline and Luo, the Examiner relies on the fact that Luo's polymer is prepared using a transition metal catalyst, and Kline teaches a transition metal catalyst deactivator. There are at least four major shortcomings to the Examiner's line of reasoning, in the face of which Appellants do not believe that the Examiner has established a *prima facie* case of obviousness:

- 1. The Examiner improperly combines Luo with Kline against the express teachings of Kline;
- 2. The Examiner does not recognize that there is a fundamental difference between catalyst deactivators and antioxidants;
- 3. The disclosure of a broad genus of dialkylaminomethylphenol (DAAMP) compounds by Kline does not necessarily render obvious the claimed compound; and
- 4. The Examiner impermissibly relies on hindsight.

1. KLINE TEACHES AGAINST WHAT THE EXAMINER CLAIMS IS OBVIOUS

In order to fairly determine whether the prior art contains the motivation to combine references, the entire reference must be considered, including any portions

⁶ *In re Dow Chemical Co.*, 837 F.2d 469, 473, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988).

that teach away from the claimed invention.⁷ It is improper to combine references where the references teach away from their combination.⁸ The Examiner concedes that Kline does not teach syndiotactic 1,2-polybutadiene. The Examiner asserts however, that it would have been obvious to one of skill in the art to substitute the syndiotactic 1,2-polybutadiene of Luo for the stereoregular polymers of Kline. This assertion contradicts the express teaching of Kline.

The "benefit" taught by Kline is deactivation of the transition metal catalyst, not stabilization of the polymer from thermal crosslinking. Kline teaches "[a]lthough all of the DAAMP compounds are metal deactivators, many are not very effective as antioxidants."⁹ This distinction was either ignored or misunderstood by the Examiner, who asserted in the final Office Action "[w]hether the [DAAMP compound] is called a deactivator, an antioxidant, or a stabilizer is a matter of nomenclature... ." But, preventing thermal cross-linking or gellation is a different function than deactivating a transition metal catalyst. And, Kline teaches that many DAAMP compounds cannot be used as antioxidants, which teaches away from combining the cited references to achieve the claimed invention.

Kline teaches that not all stereoregular polymers will benefit by the use of a dialkylaminomethylphenol (DAAMP).¹⁰ Only those polymers containing the residue of a transition metal catalyst will benefit, because the DAAMP compounds disclosed by Kline function as transition metal deactivators.¹¹ The converse of Kline's statement, under principles of logical deduction, is not necessarily true. The Examiner however, erroneously interprets this statement to mean that all polymers containing the residue of a transition metal catalyst will benefit. Kline does not teach that all polymers containing the residue of a transition metal catalyst will benefit. There is no support found in Kline for the Examiner's conclusion that because the syndiotactic 1,2-polybutadiene of Luo is made by using a chromium catalyst, it necessarily will benefit from the use of a DAAMP compound.

When Kline is properly interpreted and his teachings are considered as a

⁷ *Id.*

⁸ *In re Grasselli*, 713 F.2d 731, 743, 218 U.S.P.Q. 769, 779 (Fed. Cir. 1983).

⁹ Column 3, lines 46-48.

¹⁰ Column 3, lines 39-41.

¹¹ Column 3, lines 41-43.

whole, there would have been no reasonable expectation that Kline's transition metal catalyst deactivator would function successfully as an antioxidant in Luo's syndiotactic 1,2-polybutadiene.

2. THE EXAMINER HAS FAILED TO PROVIDE SUPPORT TO SHOW THAT CATALYST DEACTIVATORS ARE EQUIVALENT TO ANTIOXIDANTS

When an examiner relies on a scientific theory, evidentiary support for the existence and meaning of that theory must be provided.¹² The Examiner has failed to provide any evidence that catalyst deactivators are necessarily equivalent to antioxidants. In contrast, Appellants have provided objective evidence that catalyst deactivators are not equivalent to antioxidants.

The Examiner's interpretation of Kline is disproved by objective evidence made of record in the Declaration of Steven Luo, filed on February 5, 2003. This evidence demonstrates that 2,4,6-tris(dimethylaminomethyl)phenol, one of the most preferred DAAMP compounds according to the teaching of Kline, is ineffective in preventing syndiotactic 1,2-polybutadiene from thermal crosslinking. When an applicant submits evidence traversing a rejection, the examiner must reconsider the patentability of the claimed invention.¹³ The ultimate determination of patentability must be based on consideration of the entire record, by a preponderance of evidence, with due consideration to the persuasiveness of any arguments and any secondary evidence.¹⁴

3. THE BROAD GENUS OF DAAMP COMPOUNDS DISCLOSED BY KLINE DON'T NECESSARILY WORK AS ANTIOXIDANTS

Another important shortcoming in the Examiner's reasoning is illustrated by the Examiner's statement in the final Office Action, "One can expect that all compounds conforming to said formula are applicable as catalyst deactivators, and therefore one would be motivated to use any of them." The Examiner improperly concludes that, because the 2,6-dialkyl-4-(dialkylaminomethyl)phenols claimed by Appellants fall within the broad genus of DAAMP compounds disclosed by Kline, a

¹² *In re Grose*, 592 F.2d 1161, 201 U.S.P.Q. 57 (C.C.P.A. 1979).

¹³ *In re Oetiker*, 977 F.2d 1443, 24 U.S.P.Q.2d 1443 (Fed. Cir. 1992).

¹⁴ *Id.*

prima facie case of obviousness is made. This is contrary to well-established Federal Circuit case law, however. The fact that a claimed species or subgenus is encompassed by a prior art genus is not sufficient by itself to establish a *prima facie* case of obviousness.¹⁵

It is the properties and utilities that provide real world motivation for a person of ordinary skill to make species structurally similar to those in the prior art.¹⁶ Properties are relevant to the creation of a *prima facie* case in the sense of affecting the motivation of a researcher to make compound closely related to or suggested by a prior art compound.¹⁷ And yet, the Examiner has failed to appreciate or refused to consider Appellants arguments regarding the difference in stabilization properties of Appellants' claimed phenols and those of the broad, DAAMP genus taught by Kline. Appellants' arguments are supported by the comparative experiments reported in the Declaration of Steven Luo, filed on February 5, 2003, which illustrate that 2,4,6-tris(dimethylaminomethyl)phenol, one of the most preferred catalyst deactivators according to the teaching of Kline, is ineffective in preventing syndiotactic 1,2-polybutadiene from thermal crosslinking. Accordingly, Appellants do not believe that one of ordinary skill in the art would be motivated use the catalyst deactivators of Kline to practice the claimed invention.

Moreover, even assuming that Kline had taught that DAAMP compounds were antioxidants for the polymers he disclosed, because of the unpredictability of the art, the effectiveness of the DAAMP compounds for syndiotactic 1,2-butadiene would not be obvious to one of ordinary skill in the art.

Any presumption of obviousness is further rebutted by at least two additional factors:

- a. There are significant differences between the claimed structures and Kline's preferred species; and
- b. One of ordinary skill in the art would not have been motivated to select the claimed species.

¹⁵ *In re Baird*, 16 F.3d 380, 382, 29 USPQ2d 1550, 1552 (Fed. Cir. 1994).

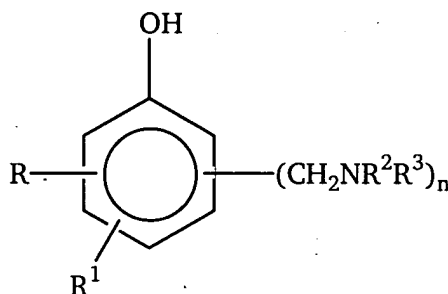
¹⁶ *In re Stemniski*, 444 F.2d 581, 586, 170 USPQ 343, 348 (CCPA 1971).

¹⁷ *In re Dillon*, 919 F.2d 688, 16 U.S.P.Q.2d 7897 (Fed. Cir. 1990), *cert denied* 500 U.S. 904 (1991).

a. There Are Significant Differences Between The Claimed Structures And Kline's Preferred Species

A teaching or suggestion within the reference of a preferred species or subgenus that is significantly different in structure from the claimed species or subgenus should be considered.¹⁸ This weighs against selecting the claimed species or subgenus and thus against a determination of obviousness.¹⁹

Kline teaches that the genus of dialkylaminomethylphenol (DAAMP) compounds represented by the following formula are effective transition metal catalyst deactivators



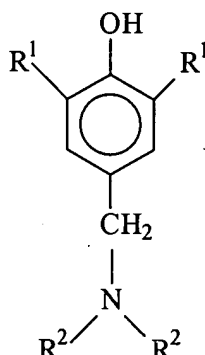
wherein R and R¹ are selected from the group consisting of hydrogen and alkyl radicals having 1 to 12 carbon atoms, wherein n is an integer from 1 to 3, wherein, when n is 1, R² and R³ are joined through a member of the group consisting of --CH₂-- and --O-- to constitute with the attached nitrogen atom a heterocyclic radical and wherein, when n is 2 or 3, R² and R³ are selected from the group consisting of alkyl radicals having 1 to 4 carbon atoms, hydroxy alkyl radicals having 2 to 4 carbon atoms or can be joined through a member of the group consisting of --CH₂-- and --O-- to constitute with the attached nitrogen atom a heterocyclic radical and wherein the total number of substituents on the phenolic ring in addition to the hydroxy group is from 1 to 5, with the proviso that when the phenolic ring contains 4 or 5 substituents the radicals --(CH₂

¹⁸ "Guidelines for the Examination of Claims Directed to Species of Chemical Compositions Based Upon a Single Prior Art Reference," M.P.E.P. § 2144.08(A)(4)(c) (citing *Baird*, 16 F.3d at 382-83, 29 USPQ2d at 1552).

¹⁹ *Baird*, 16 F.3d at 382-83, 29 USPQ2d at 1552 (reversing obviousness rejection of species in view of large size of genus and disclosed "optimum" species which differed greatly from and were more complex than the claimed species).

$\text{NR}^2 \text{R}^3)_n$ are in ortho or para positions.²⁰

The claimed composition includes an antioxidant defined by the formula



where each R^1 and R^2 , which may be the same or different, are mono-valent organic groups, or where each R^1 , which may be the same or different, is a mono-valent organic group and the two R^2 groups join to form a divalent organic group.

Significant differences exist between Kline's preferred structures and the claimed structure. The antioxidant recited in the pending claims includes only one dialkylaminomethyl functional group that occupies a position *para* to the hydroxyl group. In contradistinction, Kline suggests that preferred results are achieved when the dialkylaminomethylphenol includes two or three dialkylaminomethyl groups occupying at least one position *ortho* to the hydroxyl groups, most preferably occupying both *ortho* positions.²¹

Further, evidence of record shows that compounds within the genus of DAAMP compounds disclosed by Kline cannot be expected to have similar properties. Kline states that they have similar properties with respect to catalyst deactivation, but they have dissimilar properties in the area of antioxidation.²² The only teaching that any of the DAAMP compounds are effective antioxidants for syndiotactic 1,2-polybutadiene comes from Appellants' own application.

b. One of Ordinary Skill in the Art Would Not have Been Motivated To Select the Claimed Species

²⁰ Column 1, lines 42-68.

²¹ Column 2, lines 1-5.

²² Column 3, lines 46-48 ("Although all of the DAAMP compounds are metal deactivators, many are not very effective as antioxidants.").

Guidelines published by the U.S. Patent and Trademark Office direct the Examiner to:

determine whether one of ordinary skill in the relevant art would have been motivated to make the claimed invention as a whole, i.e., to select the claimed species or subgenus from the disclosed prior art genus.²³

The Examiner has failed to show that one of ordinary skill in the art of polymer antioxidants would have been motivated to select the claimed species to prevent thermal crosslinking of syndiotactic 1,2-polybutadiene. There is no teaching in Kline or in Luo regarding how to choose effective antioxidants from among the genus of DAAMP compounds.

4. THE EXAMINER HAS IMPROPERLY RELIED UPON HINDSIGHT

It is a basic tenet that, when applying 35 U.S.C. § 103, the references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention.²⁴ Even if one of ordinary skill in the art had ignored Kline's express teaching that many DAAMP compounds won't work as antioxidants and tried them anyway, the expectation of success would only result if one happened to select the few specific compounds claimed by Appellants. The only way the Examiner could have arrived at the conclusion that DAAMP compounds are effective antioxidants is through Appellants' own disclosure.

In summary, there is no suggestion in Kline that DAAMP compounds will operate effectively as antioxidants in syndiotactic 1,2-polybutadiene and, in fact, Kline teaches that DAAMP compounds are not effective antioxidants. There is no suggestion in Luo to use the DAAMP compounds taught by Kline. The Examiner's assertion that catalyst deactivator or antioxidant is only a matter of nomenclature is unsupported. Moreover, Appellants have submitted objective evidence that DAAMP compounds are not universally effective in preventing the thermal crosslinking of polymers prepared by using transition metal catalysts. Appellants have rebutted any presumption of obviousness based upon Kline's disclosure of a broad genus of DAAMP compounds. The Examiner has therefore failed to establish a *prima facie* case of obviousness.

²³ M.P.E.P. § 2144.08(A)(4).

²⁴ *In re Dembiczak*, 175 F.3d 994, 999, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999).

B. APPELLANTS HAVE REBUTTED ANY ALLEGED PRIMA FACIE CASE OF OBVIOUSNESS

Even if a *prima facie* case of obviousness is made, the Examiner must evaluate any evidence of secondary considerations. Evidence and arguments to rebut a *prima facie* case can be presented in the specification,²⁵ by counsel,²⁶ or by way of an affidavit or declaration under 37 CFR 1.132.²⁷ A *prima facie* case can be rebutted by proof of unexpectedly advantageous results.²⁸

In the present case, Appellants have provided ample objective evidence to illustrate the unexpected discovery of useful antioxidants to prevent thermal crosslinking of syndiotactic 1,2-polybutadiene. Moreover, the antioxidative ability of the claimed compounds is not shared by other prior art compounds. For example, in the as-filed specification, Appellants state:

[t]he unexpected discovery that 2,6-dihydrocarbyl-4-(dihydrocarbylaminoethyl)phenol is a useful antioxidant to prevent the thermal crosslinking of high-vinyl polybutadiene provides many advantages. Indeed, many antioxidants are not capable of stabilizing high-vinyl polybutadiene even though many antioxidants are commonly used to stabilize many other rubbers.²⁹

Appellants support this statement with comparative examples on pages 14-15 of the specification. These examples show that nine substances, commonly used as polymer stabilizers, do not work effectively for syndiotactic 1,2-polybutadiene. Also in the specification, Appellants note the unpredictability of the art of selecting a useful antioxidant.³⁰ This is reiterated in the Declaration of Steven Luo, filed February 5, 2003, in which Dr. Luo states that the art of choosing a suitable antioxidant for a particular polymer is largely unpredictable and empirical. Comparative experiments reported in the Declaration illustrate that one of the compounds most preferred by Kline for catalyst deactivation in stereoregular polymers does not stabilize syndiotactic 1,2-polybutadiene from thermal crosslinking. If a technology is unpredictable, it is less likely that structurally similar species will render a claimed species obvious because it

²⁵ *In re Soni*, 54 F.3d 746, 750, 34 USPQ2d 1684, 1687 (Fed. Cir. 1995).

²⁶ *In re Chu*, 66 F.3d 292, 299, 36 USPQ2d 1089, 1094-95 (Fed. Cir. 1995).

²⁷ *See, e.g., Soni*, 54 F.3d at 750, 34 USPQ2d at 1687; *In re Piasecki*, 745 F.2d 1468, 1474, 223 USPQ 785, 789-90 (Fed. Cir. 1984).

²⁸ *In re Albrecht*, 514 F.2d 1389, 185 U.S.P.Q. 585 (C.C.P.A. 1975).

²⁹ Specification, page 4, lines 20-25.

³⁰ Specification, page 2, lines 10-13.

may not be reasonable to infer that they would share similar properties.³¹ In light of the unpredictability of the art, it is apparent that the Examiner's generalization predicting that "all compounds conforming to said formula are applicable as catalyst deactivators, and therefore one would be motivated to use any of them" for stabilizing a broad genus of polymers is unfounded.

Accordingly, Appellants maintain that even if, for the sake of argument, the Examiner has established a *prima facie* case of obviousness, objective evidence of unexpectedly advantageous results overcomes any presumption associated therewith.

INDEPENDENT BASIS OF PATENTABILITY FOR CLAIMS 2, 21 AND 22

Claim 2 recites that the antioxidant is present in an amount of from about 0.1 to about 10 parts by weight per 100 parts by weight of the syndiotactic 1,2-polybutadiene. Claims 21 states that the antioxidant is present in an amount from about 0.2 to about 5 parts by weight per 100 parts by weight of the syndiotactic 1,2-polybutadiene. Claim 22 recites that the antioxidant is present in an amount from about 0.5 to about 3 parts by weight per 100 parts by weight of the syndiotactic 1,2-polybutadiene. Appellants maintain that Claims 2, 21, and 22 are patentably distinct from Kline alone, or in view of Luo.

Kline does not provide any teaching that the amount of DAAMP compound is related to the amount of polymer. Instead, Kline teaches that

[t]he level of the DAAMP compound will vary depending upon the amount of catalyst used in preparing the polymer. The amount of DAAMP is normally from one mole to five moles per mole of transition metal in the catalyst.³²

The Examiner states in the Final Office Action that Kline uses 1 part by weight per 100 parts of polymer, and references the Examples. Appellants have scrutinized the Examples of Kline, and have failed to find any teaching that 1 part by weight DAAMP compound was used per 100 parts polymer. The only mention of 1 part by weight refers to the addition of the *phenolic antioxidant* that Kline teaches as a preferable component that is added in addition to the DAAMP compound.³³ Contrary to

³¹ See, e.g., *In re May*, 574 F.2d 1082, 1094, 197 USPQ 601, 611 (C.C.P.A. 1978).

³² Column 4, lines 23-27.

³³ See Column 3, lines 44-68 ("Preferably a hindered monohydric phenolic antioxidant or hindered bisphenolic antioxidant is added along with the DAAMP.").

the Examiner's statement, Kline does not teach using 1 part DAAMP compound per 100 parts by weight polymer.

For comparative purposes, Appellants point to their application, namely Example 1, in which 0.05 mmoles of iron compound was used as a catalyst. This corresponds to about 0.1 mmoles per 100 parts polymer. According to the teachings of Kline, this would suggest the use of from about 0.1 to about 0.5 mmoles of DAAMP compound per 100 parts polymer, or in other words, from about 0.02 g to about 0.1 g of 2,6-di-t-butyl-4-(dimethylaminomethyl)phenol.³⁴ In contrast, 1.5 g of 2,6-di-t-butyl-4-(dimethylaminomethyl)phenol antioxidant is used in Example 1 (3.0 g per 100 g polymer), which is an amount significantly distinct from that taught by Kline.

IMPROPER RESTRICTION OF CLAIMS

Appellant maintains that the Examiner has improperly subjected claims 6-10 (Group II) and 12-19 (Group III) to a restriction requirement. Group II claims are directed to a method of stabilizing high-vinyl polybutadiene, and Group III claims are drawn to a method of preparing a vulcanizable composition. Appellants believe that the restriction requirement was improper because a search for the methods of Group II and Group III would not be unduly extensive or burdensome. In an effort to further prosecution at the time the restriction requirement was made, Appellants provisionally elected to prosecute claims 1-5, while traversing the requirement. Appellants have not cancelled the claims of Groups II and III, and respectfully request that the restriction requirement be reconsidered.

Even if the restriction requirement is proper, Appellants request rejoinder of the claims. Group II claims contain all of the limitations of Group I claims. Likewise, Group III contains all of the limitations of Group I claims. Therefore, upon allowance of claims of Group I, Group II and Group III claims should be rejoined.³⁵

IX. CONCLUSION

Appellant maintains that the Examiner has erred in concluding that the claims on appeal are obvious over the cited prior art. Further, Appellant maintains that

³⁴ According to the Aldrich Handbook of Fine Chemicals and Laboratory Equipment, 2000-2001, the formula weight of 2,6-di-t-butyl-4-(dimethylaminomethyl)phenol is 263.4 g.

the Examiner has improperly subjected claims 6-10 and 12-19 to a restriction requirement, or alternatively, that the claims should be rejoined.

Per the accompanying Transmittal Sheet, The Commissioner is authorized to charge Deposit Account No. 06-0925 for \$320.00, which is the amount due for the filing of this brief.

Respectfully submitted,

Tama L. Drenski

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July 22, 2002



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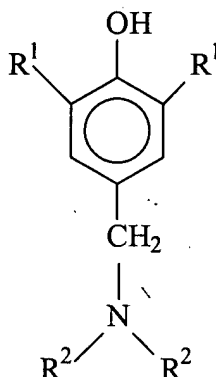
U.S. Serial No. 09/923,983

Client's Reference No.: P01018US1A

Claims 1, 2, 4-10, 12-19, and 21-22

U.S. CLAIMS AS THEY CURRENTLY STAND

1. A stabilized syndiotactic 1,2-polybutadiene composition comprising:
- a syndiotactic 1,2-polybutadiene, and
 - an antioxidant defined by the formula



- where each R¹ and R², which may be the same or different, are mono-valent organic groups, or where each R¹, which may be the same or different, is a mono-valent organic group and the two R² groups join to form a divalent organic group.
2. The composition of claim 1, where the antioxidant is present in an amount from about 0.1 to about 10 parts by weight per 100 parts by weight of the syndiotactic 1,2-polybutadiene.
4. The composition of claim 1, where the antioxidant is 2,6-di-*t*-butyl-4-(dimethylaminomethyl)phenol, 2,6-di-*t*-butyl-4-(diethylaminomethyl)phenol, 2,6-di-*t*-butyl-4-(diphenylaminomethyl)phenol, 2,6-di-*t*-butyl-4-(di-*t*-butylaminomethyl)phenol, 2,6-di-*t*-butyl-4-(dineopentylaminomethyl)phenol, 2,6-di-*t*-butyl-4-(diisopropylaminomethyl)phenol, 2,6-diethyl-4-(dimethylaminomethyl)phenol, 2,6-dimethyl-4-(dimethylaminomethyl)phenol, 2,6-dipropyl-4-

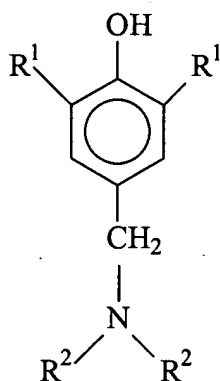
(dimethylaminomethyl)phenol, 2,6-isopropyl-4-(dimethylaminomethyl)phenol, 2,6-diphenyl-4-(dimethylaminomethyl)phenol, 2,6-dineopentyl-4-(dimethylaminomethyl)phenol, or mixtures thereof.

5. The composition of claim 4, where said antioxidant is 2,6-di-*t*-butyl-4-(dimethylaminomethyl)phenol.

6. A method of stabilizing syndiotactic 1,2-polybutadiene from thermal crosslinking, the method comprising:

providing a composition of matter comprising syndiotactic 1,2-polybutadiene; and

adding to the composition an antioxidant defined by the formula



where each R¹ and R², which may be the same or different, are mono-valent organic groups, or where each R¹, which may be the same or different, is a mono-valent organic group and the two R² groups join to form a divalent organic group, thereby forming a mixture of syndiotactic 1,2-polybutadiene and antioxidant.

7. The method of claim 6, where the antioxidant is 2,6-di-*t*-butyl-4-(dimethylaminomethyl)phenol.

8. The method of claim 6, where the composition of matter comprising syndiotactic 1,2-polybutadiene includes a solvent that forms a cement with the syndiotactic 1,2-

polybutadiene; and the method further comprising the step of isolating the mixture of syndiotactic 1,2-polybutadiene and the antioxidant from the solvent after said step of adding the antioxidant.

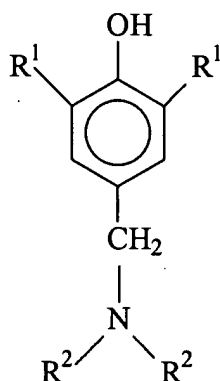
9. The method of claim 6, further comprising the step of adding tris(nonylphenyl) phosphite to the composition of matter comprising syndiotactic 1,2-polybutadiene.

10. The method of claim 6, where said step of adding the antioxidant includes adding from about 0.1 to about 10 parts by weight of the antioxidant per 100 parts by weight of the syndiotactic 1,2-polybutadiene.

12. A method of preparing a vulcanizable composition of matter, the method comprising:

providing a composition of matter comprising syndiotactic 1,2-polybutadiene;

adding to the syndiotactic 1,2-polybutadiene composition an antioxidant defined by the formula



where each R¹ and each R², which may be the same or different, are mono-valent organic groups, or where each R¹, which may be the same or different, is a mono-valent organic group and the two R² groups join to form a divalent organic group, thereby forming a mixture of syndiotactic 1,2-polybutadiene and antioxidant;
providing a rubber; and

compounding the rubber with the mixture of the syndiotactic 1,2-polybutadiene and antioxidant.

13. The method of claim 12, where the composition of matter comprising syndiotactic 1,2-polybutadiene includes a solvent that forms a cement with the syndiotactic 1,2-polybutadiene; and the method further comprising the step of isolating the mixture of syndiotactic 1,2-polybutadiene and the antioxidant from the solvent after said step of adding the antioxidant.

14. The method of claim 12, where said antioxidant is 2,6-di-*t*-butyl-4-(dimethylaminomethyl)phenol.

15. The method of claim 13, where said step of isolating includes direct drum drying at temperatures in excess of 100°C.

16. The method of claim 13, where said step of isolating includes steam desolventizing the cement and drying the mixture of syndiotactic 1,2-polybutadiene and antioxidant at a temperature in excess of 100°C.

17. The method of claim 12, further comprising the step of adding tris(nonylphenyl) phosphite to the composition of matter comprising syndiotactic 1,2-polybutadiene.

18. The method of claim 12, where said step of adding the antioxidant includes adding from about 0.1 to about 10 parts by weight of the antioxidant per 100 parts by weight of the syndiotactic 1,2-polybutadiene.

19. The method of claim 12, where said step of compounding includes mixing the rubber and mixture of syndiotactic 1,2-polybutadiene and antioxidant at a temperature in excess of 100°C.

21. The composition of claim 1, where the antioxidant is present in an amount from about 0.2 to about 5 parts by weight per 100 parts by weight of the syndiotactic 1,2-polybutadiene.

22. The composition of claim 1, where the antioxidant is present in an amount from about 0.5 to about 3 parts by weight per 100 parts by weight of the syndiotactic 1,2-polybutadiene.



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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the application of

STEVEN LUO,
KOJI MASAKI, and
TATSURO HAMADA

Serial No. 09/923,983

Filed August 7, 2001

For STABILIZING HIGH-VINYL
POLYBUTADIENE

) Group Art Unit: 1713
)
)
) Examiner: Rip A. Lee
)
)

CERTIFICATE OF MAILING

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)
)

) *Kimberly A. Bright*
) KKimberly A. Bright, Secy. to Arthur M. Reginelli
)
)

TRANSMITTAL SHEET

Enclosed are the following documents:

Appeal Brief (in triplicate) (w/attached Certificate of Mailing)
Exhibit A (claims in triplicate)
Return Receipt Postcard

AUTHORIZATION TO CHARGE DEPOSIT ACCOUNT

The Commissioner is hereby authorized to charge payment of any fees associated with this communication or credit any overpayment to Deposit Account No. 06-0925.

Respectfully submitted,

Tama L. Drenski

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September 18, 2003